

Six new species of *Hydrocotyle* L. (Apiaceae) from Queensland

A.R. Bean & M.J. Henwood

Summary

Bean, A.R. & Henwood, M.J. (2003). Six new species of *Hydrocotyle* L. (Apiaceae) from Queensland. *Austrobaileya* 6(3): 537–548. Descriptions, illustrations and a distribution map are provided for six new Queensland species of *Hydrocotyle*, viz. *H. digitata*, *H. dipleura*, *H. miranda*, *H. oraria*, *H. paludosa* and *H. tumida*. A key to all Queensland species is provided.

Keywords: *Hydrocotyle*, taxonomy, new species, Queensland flora, Apiaceae, Umbelliferae.

A.R. Bean, Queensland Herbarium, Brisbane Botanic Gardens, Mt Coot-tha Road, Toowong, Queensland, 4066, Australia

M.J. Henwood, John Ray Herbarium, School of Biological Sciences, University of Sydney, New South Wales, 2006, Australia

Introduction

Hydrocotyle is found throughout the world, but especially in the southern hemisphere. Estimates of the total number of species vary from 75 (Mathias & Constance 1976) to “over 130” (Eichler 1986). Recent molecular studies (Plunkett *et al.*, 1996, 1997) have indicated that *Hydrocotyle* is nested within a redefined Araliaceae. However, with the exception of a somatic chromosome number of 12, non-molecular evidence for this placement has proven to be somewhat elusive (Henwood & Hart, 2001).

Few taxonomic studies into Australian *Hydrocotyle* have been undertaken since the time of Mueller and Bentham. Wakefield (1951) provided a new combination, and then a new species (Wakefield 1955). Eichler (1965) named *H. foveolata*, and subsequently published a series of excellent nomenclatural papers for the genus as a whole.

In common with most species of the genus, Queensland *Hydrocotyle* species are found in rather mesic sites, either in areas of high rainfall, or in damp areas (creek banks, springs, seepage areas or swamp margins).

The new species described here show morphological affinity with *H. pedicellosa* F.Muell. (*H. miranda*); *H. tripartita* R.Br. ex Rich. (*H. digitata*, *H. oraria*, *H. paludosa*); *H. peduncularis* R.Br. ex Rich. (*H. dipleura*) and *H. grammaticarpa* F.Muell. (*H. tumida*). Each species is, however, clearly separable by a number of vegetative and floral characters outlined in the following treatment.

Hydrocotyle pedicellosa occurs in rainforest and extends from northern New South Wales to New Guinea, while *H. tripartita* extends from Victoria (Duretto 1999) to the central coast of Queensland (at Eungella). Its Queensland occurrences are on rainforest margins, often at high altitudes. *H. peduncularis* is widespread in south-eastern Australia, whereas *H. grammaticarpa* is distributed across northern Australia.

Descriptive terminology for the ‘ribs’ of mericarps follows Tseng (1967). The ribs (and their underlying veins) closest to the commissure are referred to as marginal ribs, lateral ribs sit between the marginal and dorsal ribs on the lateral faces of the mericarps.

Taxonomy**Key to the Queensland species of *Hydrocotyle* (Apiaceae)**

1. Leaves peltate 2
 Leaves not peltate 3
2. Inflorescence a many-branched umbel, each branch racemose;
 leaf lamina broadly elliptic, crenate ***H. bonariensis**
 Inflorescence spike-like in appearance, not or sparsely branched;
 leaf lamina orbicular, crenulate **H. verticillata**
3. Lamina palmate, comprising 3–5 leaflets 4
 Lamina simple, variously lobed or divided 7
4. Mericarps conspicuously winged; leaflets (3–)5, terminal leaflet longest,
 1.5–4 cm long **H. geraniifolia**
 Mericarps not winged; leaflets 3, all about the same length, 0.5–1.5 mm long 5
5. Leaflets narrowly cuneate; 0–10 hairs on abaxial surface of each leaflet **H. paludosa**
 Leaflets broadly cuneate; 20–100 hairs on abaxial surface of each leaflet 6
6. Mericarps 0.9–1.2 mm long; peduncles 4–9 mm long; lateral leaflets incised
 for 70–90% of length **H. digitata**
 Mericarps 0.6–0.8 mm long; peduncles 13–35 mm long; lateral leaflets
 incised for 30–60% of length **H. tripartita**
7. Leaves palmatifid, 3–lobed, with the incisions extending 70–90% of lamina radius . **H. oraria**
 Leaves entire or 3–9–lobed, incised to <50% of lamina radius 8
8. Lamina glabrous 9
 Lamina sparsely to densely hairy 12
9. Fruits not markedly laterally flattened; mericarps indistinct 10
 Fruits markedly laterally flattened; mericarps readily distinguished 11
10. Stems glabrous; fruits pyriform to obconical, 0.8–1.0 mm long; pedicels
 0.1–0.3 mm long **H. tumida**
 Stems sparsely hairy; fruits ellipsoidal, 0.5–0.6 mm long; pedicels
 0.4–0.6 mm long **H. grammatocarpa**
11. Lamina unlobed or with 3–5 broad obtuse lobes; stipules deeply laciniate;
 mericarps with 2 pairs of lateral ribs; petiole glabrous **H. dipleura**
 Lamina consistently lobed, and the lobes further divided; stipules entire
 or shortly toothed; mericarps with 1 pair of lateral ribs; distal end of petiole
 usually with a few hairs **H. peduncularis**
12. Inflorescence typically branched with numerous pedunculate umbels of
 flowers at various positions on the rachis 13
 Inflorescences consisting of a single umbel 14
13. Pedicels 1–1.7 mm long; peduncles 1–8 mm long; mature mericarps
 1.4–1.7 mm long **H. miranda**
 Pedicels 3–8 mm long; peduncles up to 30 mm long; mature mericarps
 1.1–1.3 mm long **H. pedicellosa**

14. Flowers with pedicels 1.5–5 mm long **H. laxiflora**
 Flowers and/or fruits sessile or pedicels up to 0.5 mm long 15
15. Fruiting styles 0.2–0.35 mm long, not readily visible to naked eye; lateral
 rib on mericarp conspicuous; leaves with 5 indistinct to prominent lobes . . . **H. acutiloba**
 Fruiting styles 0.6–1 mm long, readily visible, giving clusters a “hairy”
 appearance; lateral rib on mericarp obscure or lacking; leaves usually
 with 7 lobes **H. laxiflora**

Hydrocotyle dipleura A.R.Bean sp. nov. affinis *H. pedunculari* foliis non lobatis vel lobis 3–5 latis obtusis praeditis, stipulis profunde laciniatis (integris vel breve dentatis in *H. peduncularis*), inflorescentiis 6–9-floris (3–6-floris in *H. pedunculari*), mericarpis paribus duobus costarum intermediis praeditis (pare uno in *H. pedunculari*) differt. **Typus:** Queensland. SOUTH KENNEDY DISTRICT: Carmichael River, “Doongmabulla”, north-west of Clermont, 3 February 1998, R.J. Fensham 3338 (holo: BRI).

Perennial glabrous prostrate herb with creeping stems, mostly rooting at the nodes. Leaves occurring singly at the nodes. Stipules white, lacinate, 0.4–2.5 mm long, margin deeply dissected. Petioles erect, 6–50 mm long. Lamina orbicular-cordate or reniform (subtending 270–350 degrees of arc), pale yellowish-green, 2–8 mm in radius, palmately 5–7-veined, glabrous; margin entire or with 3–5 broad shallow obtuse lobes. Inflorescences simple, umbellate, 6–9 flowered, peduncles 3–17 mm long (shorter than adjacent petiole), pedicels lacking at anthesis, bracts 0.4–0.6 mm long. Calyx absent. Petals greenish-white, deltate, c. 0.4 mm long. Fruits comprising two laterally flattened mericarps, each 0.55–0.65 mm long, 0.45–0.6 mm wide. Lateral ribs in 2 pairs, prominent; dorsal ribs prominent and forming a narrow wing; surface smooth, carpophore absent. Fruiting pedicels absent or up to 0.4 mm long. Styles divergent to reflexed, 0.25–0.3 mm long. **Fig. 1.**

Specimens examined: Queensland. MITCHELL DISTRICT: Smoky Spring, Lake Huffer, N of Aramac, Apr 1999, Fensham 3807 (BRI); c. 80 km NNE of Aramac, Nov 1997, Thompson MUT64 & Baumgartner (BRI). SOUTH KENNEDY DISTRICT: Moses Spring, “Doongmabulla”, NW of Clermont, Apr 1999, Fensham 3808 (BRI). WARREGO DISTRICT: “Bundoona”, c. 50 km NW of Eulo, Feb 1999, Fensham 3655 (BRI).

Distribution and habitat: *H. dipleura* is endemic to Queensland, and is known from the Aramac, Clermont and Eulo areas (**Map 1**). It has a very specialised habitat, growing only on the dried-out margins of artesian springs, in highly saline soils.

Phenology: Flowers and fruits are recorded from February, April and November.

Affinities: *H. dipleura* is morphologically similar to *H. peduncularis*, but differs by the thicker yellowish-green leaves, unlobed or with 3–5 broad obtuse lobes (consistently lobed, and the lobes further divided in *H. peduncularis*); the deeply lacinate stipules (entire or shortly toothed for *H. peduncularis*), the 6–9 flowered inflorescences (3–6 flowered for *H. peduncularis*) and the mericarps with 2 pairs of lateral ribs (1 pair in *H. peduncularis*). While *H. dipleura* is glabrous, *H. peduncularis* often has a few hairs at the distal end of the petiole where it joins the lamina.

Conservation status: Under the IUCN guidelines (IUCN, 2001), a category of Vulnerable is proposed (VU B2 ab (iii)). Six locations are known, following a comprehensive floristic study of Great Artesian Basin spring systems (R. Fensham pers. comm.).

Etymology: From the Greek *di-* meaning twice and *pleura* meaning rib, and referring to the two lateral ribs on each mericarp.

Hydrocotyle miranda A.R.Bean & Henwood sp. nov. affinis *H. pedicellosae* autem pilis albidis longioribus in petiolis, pedunculis pedicellisque multo brevioribus, mericarpis longioribus differt. **Typus:** Queensland. COOK DISTRICT: Longlands

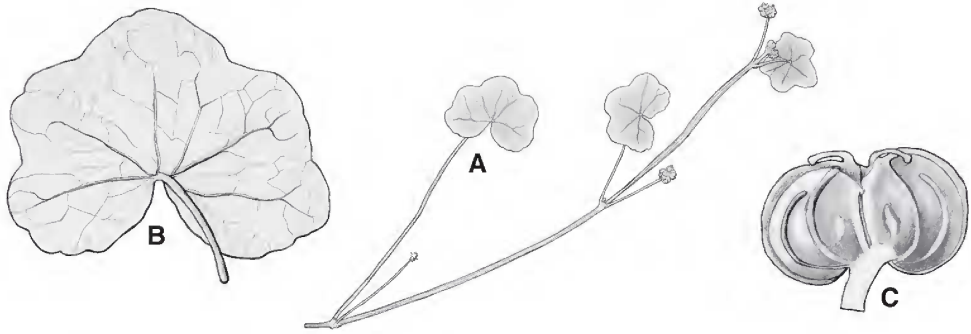


Fig. 1. *H. dipleura*. A. flowering stem. B. leaf underside. C. fruit. A,B from *Fensham* 3338 (BRI); C from *Thompson* MUT64 (BRI).

Gap State Forest, S of Atherton, 21 April 2002, A.R. Bean 18786 (holo: BRI; iso: CANB, K, L, MEL, NSW).

Perennial herb with creeping stems, mostly rooting at the nodes. Leaves occurring singly at the nodes. Stipules very broad, scarious, to 2.5 mm long, margin entire. Petioles erect, 8–15 cm long, densely hispid apically, with simple eglandular white trichomes 0.5–2.0 mm long. Lamina orbicular-cordate or reniform (subtending 270–350 degrees of arc), 45–90 mm across, with 6–9 radiating veins; margin crenate with occasional deeper incisions to 5 mm deep; lower surface moderately densely pubescent, particularly along veins, with hairs to 1.0 mm long; upper surface sparsely pubescent to almost glabrous, with hairs to 0.5 mm long. Inflorescences 2–15 cm long (shorter than adjacent petiole), proliferous, with clusters of umbels at various positions on the rachis. Individual umbels 15–30-flowered, pedicels almost lacking at anthesis. Calyx absent. Petals greenish-white, deltate, 0.5–0.7 mm long. Fruits schizocarpous, mericarps laterally flattened, 1.4–1.7 mm long, 0.7–0.8 mm wide, surface smooth; marginal and lateral ribs absent or obscure, dorsal ribs prominent and forming a narrow wing; carpophore absent. Fruiting peduncles 1–8 mm long, fruiting pedicels 1–1.7 mm long. Styles divergent, 1–1.5 mm long. **Fig. 2.**

Specimens examined: Queensland. COOK DISTRICT: Bellenden Ker Range, S. Peak, E. slope 1450 m, Aug 1971, *Balgooy* 1497 (NSW); SFR 185, Edith L.A., Feb 1972, *Dockrill & Stevens* 391 (BRI); Forestry Reserve 194, Atherton district, Jun 1963, *Hyland* AFO/2656 (BRI). NORTH KENNEDY DISTRICT: SFR251, Tableland L.A.,

400 m down Ebony road off Tully Falls Road, May 2001, *Ford* AF2807 (BRI, NSW).

Distribution and habitat: Found on parts of the Atherton Tableland and adjacent areas in north Queensland (**Map 1**). It inhabits rainforest clearings or rainforest margins, on clay-loam soils.

Phenology: Flowers recorded for April and June; fruits from February to June.

Affinities: *H. miranda* is morphologically similar to *H. pedicellosa*. Both species have large deeply cordate leaves, orbicular in outline, and both have a proliferous inflorescence, with clusters of umbels at various positions on the rachis. However, *H. miranda* differs by the pedicels 1–1.7 mm long (3–8 mm long for *H. pedicellosa*), the peduncles 1–8 mm long (up to 8–40 mm long for *H. pedicellosa*), mericarps 1.4–1.7 mm long (1.1–1.3 mm long for *H. pedicellosa*) the very obscure lobing of the lamina (distinctly 7–9 lobed for *H. pedicellosa*) and the upper petiole with white hairs 0.5–2 mm long (fawn to brown hairs 0.1–0.7 mm long for *H. pedicellosa*).

Notes: We have been unable to match this species with any named species from New Guinea or Indonesia. Some of the specimens of *H. miranda* cited above were determined as *H. javanica* Thunb. by P. Buwalda, but the latter species (as to type) has leaves where the lamina subtends less than 250 degrees of arc, and has non-proliferous (simple) inflorescences.

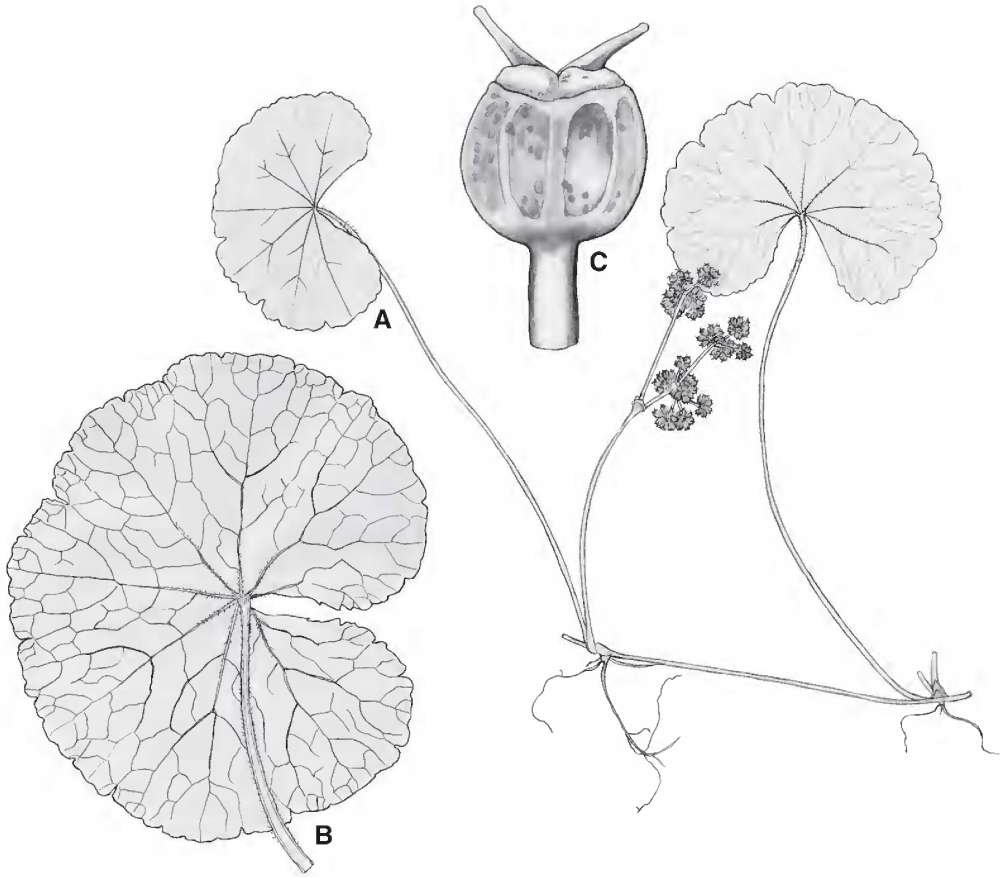


Fig. 2. *H. miranda*. A. portion of fertile plant. B. leaf underside and distal part of petiole. C. fruit. A–C from *Bean* 18786 (BRI).

Conservation status: Data deficient (IUCN 2001). Only a few collections are known, but as *Hydrocotyle* is a poorly collected genus, it may be more common than collections indicate.

Etymology: From the Latin *mirandus*, meaning wonderful or strange.

***Hydrocotyle tumida* A.R.Bean & Henwood sp.**

nov. affinis *H. grammatocarpae* autem caulibus glabris, floribus fructibusque costa conspicua transversa, et fructibus obconicis usque pyriformibus grandioribus, pedicellis brevioribus differt. **Typus:** Queensland. COOK DISTRICT: c. 8.5 km north-west of Kennedy River bridge, between Laura and Coen, 6 July 1998, A.R. Bean 13496 (holo: BRI; iso: MEL).

Hydrocotyle sp. (Strathmay J.R. Clarkson 3498A) in Henderson (2002).

Annual glabrous prostrate herb with creeping stems, mostly rooting at the nodes. Leaves occurring singly at the nodes. Stipules white, lacinate, 0.6–1.3 mm long, margin deeply dissected. Petioles erect, 4–40 mm long. Lamina orbicular-cordate (subtending 270–350 degrees of arc), green, 4–10 mm in radius, palmately 5–9-veined; margin with 5–7 shallow obtuse lobes, each lobe divided into 2–4 lobules. Inflorescences simple, umbellate, 17–25 flowered, peduncles 4–21 mm long (about same length as adjacent petiole), pedicels lacking at anthesis, bracts linear to narrowly-spathulate, c. 0.5 mm long. Calyx absent. Petals purplish-white, deltate, c. 0.3 mm long. Fruits obconical

to pyriform, elliptical in cross-section, 0.8–1.0 mm long, 1.2–1.5 mm wide on longest axis, with ribs obscured by 8 longitudinal rounded swellings on the intercostal areas and a rather prominent transverse swelling near the distal end of the fruit. Mericarps 2, indistinct, coherent. Carpophore absent. Fruiting heads forming a tight globular cluster up to 3.5 mm diameter. Fruiting pedicels 0.1–0.3 mm long; bracts 0.8–1.2 mm long. Styles divergent to erect, 0.1–0.2 mm long. **Fig. 3.**

Specimens examined: Queensland. COOK DISTRICT Coleman River, 17 km by road W of Musgrave on road to Edward River, Oct 1980, *Clarkson* 3462 (BRI, CANB); 60 km W of Strathmay on Musgrave-Edward River road, Oct 1980, *Clarkson* 3498A (BRI); 20 km south of Wakooka on the track to Starke Station, Jul 1987, *Clarkson* 7303 (BRI); 0.8 km S of the Alice River on the road from 'Oroners' to 'Koolatah', Aug 1992, *Clarkson* 9739 & *Neldner* (BRI); Bamboo Range, N of Musgrave on Peninsula Development road, Jul 1993, *Forster* PIF13455 (BRI); 28 km ENE of Violet Vale HS., Aug 1978, *Pajmans* 2890 (CANB); North Kennedy R., 8 km NW of Breeza HS., Aug 1978, *Pajmans* 3232 (CANB); Hopevale, near Isabella Falls, Aug 1976, *Scarth-Johnson* 308A (BRI); Bloodwood Lagoon, 16 miles [26 km] S of 'Dunbar', Jun 1943, *Whitehouse* (BRI, AQ 486653).

Distribution and habitat: Endemic to Queensland, and confined to lower Cape York Peninsula (**Map 1**). It grows in *Eucalyptus* or *Melaleuca* dominated woodland, in damp microhabitats.

Phenology: Flowers and fruits are recorded from June to October.

Affinities: *H. tumida* differs from *H. grammatocarpa* by its glabrous stems (sparsely hairy for *H. grammatocarpa*); flowers and fruits with a conspicuous transverse swelling (lacking in *H. grammatocarpa*); fruits obconical to pyriform (ellipsoidal for *H. grammatocarpa*); fruits 0.8–1.0 x 1.2–1.5 mm (0.5–0.6 x 0.5–0.7 mm for *H. grammatocarpa*); fruiting pedicels 0.1–0.3 mm long (0.4–0.6 mm long for *H. grammatocarpa*).

Conservation status: This is a common species with a relatively wide distribution, and the habitat is largely intact. No conservation coding is recommended.

Etymology: From the Latin *tumidus* meaning 'swollen'. This is a reference to the swollen or inflated intercostal regions of the fruits.

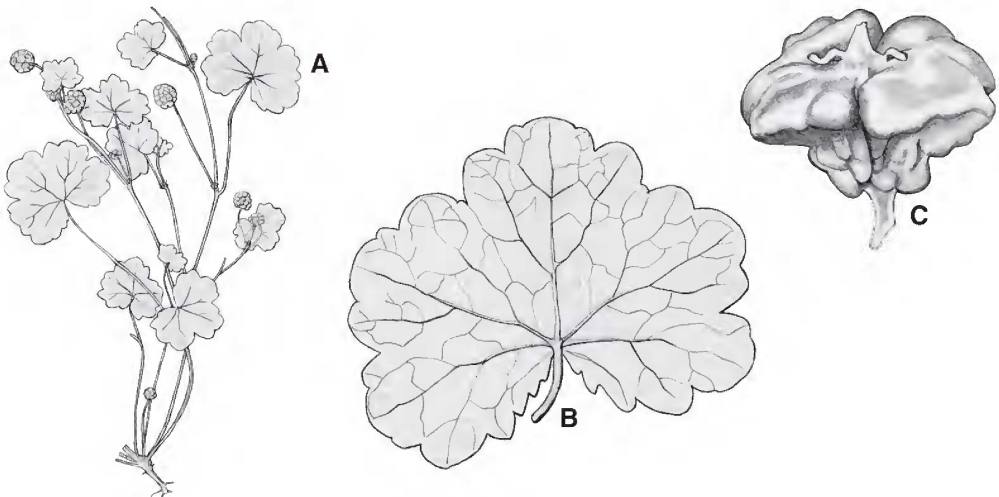


Fig. 3. *H. tumida*. A. fruiting plant. B. leaf underside. C. fruit. A–C from *Bean* 13496 (BRI).

Hydrocotyle digitata A.R.Bean & Henwood **sp. nov.** affinis *H. tripartitae*, sed foliis segmentis laminae profunde divisis, pedunculis 4–9 mm longis (13–35 mm in *H. tripartita*), mericarpis 0.9–1.2 mm longis (0.6–0.7 mm in *H. tripartita*) differt. **Typus:** Queensland. DARLING DOWNS DISTRICT: Turner Creek, 11.9 km N of Dalveen, 26 January 1995, A.R. Bean 8214 (holo: BRI; iso: CANB, HO, MEL, NSW).

Perennial herb with creeping stems, mostly rooting at the nodes. Leaves occurring singly at the nodes. Stipules broader than long, 1.2–2 x 1.5–2.5 mm, brown-streaked, margin entire or fimbriate. Petioles 50–130 mm long, with 10–30 white and brown retrorse hairs near the apex or sometimes extending along the petiole, up to 2 mm long, rarely glabrous. Leaves trifoliolate, 13–30 mm across. Lamina narrowly cuneate (60–90 degrees of arc), 6.5–15 mm long, 7–15 mm wide; upper lamina surface bright green, glabrous or with 1–5 erect white trichomes, each 1.7–2.4 mm

long; lower surface pale green, moderately hairy, with 20–50 white trichomes, each 0.7–2 mm long. Central leaflet with two shallow to deep sinuses, apex 3-lobed, each lobe divided into 3 lobules, and often with a small acute tooth laterally; lateral leaflets with 19–28 teeth, with one deep sinus (0.7–0.9 times segment length) and the two lobes divided into 3–4 lobules, each of which is 2–4 toothed. Inflorescences simple, umbellate, 10–13-flowered, peduncles 4–9 mm long (much shorter than adjacent petiole), pedicels almost lacking at anthesis, bracts c. 0.6 mm long. Calyx absent. Petals white or purple, deltate, 0.5–0.7 mm long. Styles 2, each 0.6–0.8 mm long in fruit. Fruits comprising two laterally compressed mericarps, each 0.9–1.2 mm long, 0.6–0.9 mm wide. Dorsal and lateral ribs acute, marginal ribs obscure; surface smooth. Fruiting pedicels 0.3–1.5 mm long. **Fig. 4.**

Specimens examined: Queensland. NORTH KENNEDY: S.F.R. 755 Johnstone L.A., North Johnstone River, Nov 1974, *Hyland* 7873 (CANB). DARLING DOWNS DISTRICT: Condamine River, at Warwick, Dec 1990, *Bean*

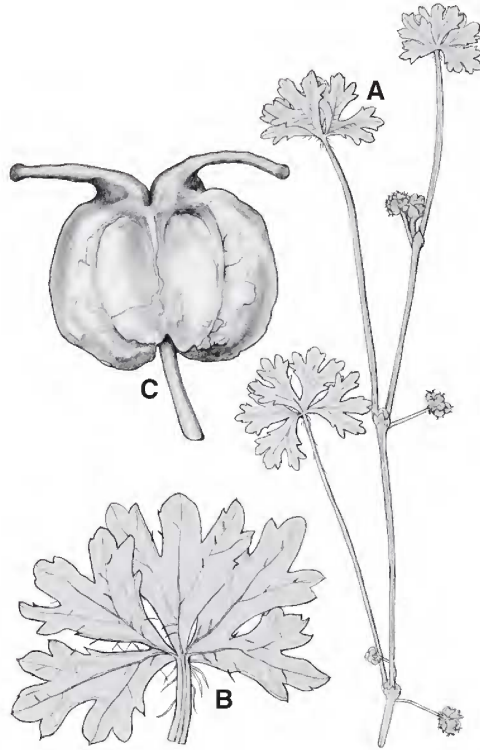


Fig. 4. *H. digitata*. A. flowering stem x 0.5. B. leaf underside x 1. C. fruit x 12. A,B from *Bean* 8214 (BRI); C from *Bean* 8218 (BRI).

2721, 2722 (BRI, CANB); Connolly Dam, S of Warwick, Oct 1996, *Bean* 10887 (BRI). **New South Wales.** NORTH COAST: below Callawajune Mtn (the Beehive or South Obelisk), c. 5.5 km SSW of Urbenville, Nov 1987, *Coveny* 12794 et al. (BRI, CANB, K, MO, NSW). NORTHERN TABLELANDS: Little Llangothlin Lake Nature Reserve, NNE of Guyra, Jan 1995, *Bean* 8284 (BRI).

Distribution and habitat: Known from near the Atherton Tableland in north Queensland, the Warwick district in far south-east Queensland (Map 1), and extending to Guyra in New South Wales. It occurs at altitudes above 500 metres, in moist to swampy areas in eucalypt woodland.

Phenology: Flowers and fruits have been recorded between October and January.

Affinities: *H. digitata* is morphologically similar to *H. tripartita*, but differs by the deeply divided lateral lamina segments (divisions 0.7–0.9 times length of segment vs. 0.3–0.6 for *H. tripartita*), the peduncles only 4–9 mm long (13–35 mm for *H. tripartita*), and the mericarps 0.9–1.2 mm long (0.6–0.7 mm long for *H. tripartita*) (**Table 1**).

Conservation status: Data deficient (IUCN 2001).

Etymology: From the Latin *digitatus*, meaning digitate or finger-like. This is in reference to the many finger-like lobes on the leaves.

Hydrocotyle oraria A.R.Bean *sp. nov.* affinis *H. tripartitae* autem foliis segmentis laminae incomplete dissectis tantum 3–8 dentibus praeditis, pilis infra et in petiolo paucioribus, umbellis floribus paucioribus constructis differt. **Typus:** Queensland. COOK DISTRICT: Eubenangee Swamp National Park, Alice River end, 29 October 2001, *P.I. Forster* 27656, *R. Booth & R. Jensen* (holo: BRI).

Annual? herb with creeping stems, mostly rooting at the nodes. Leaves occurring singly at the nodes. Stipules broader than long, 0.7–0.9 x 1–1.2 mm, white, translucent, margin lacinate or fimbriate. Petioles 6–30 mm long, with 5–10 white retrorse hairs near the apex, 0.4–0.7 mm long, otherwise glabrous. Lamina simple, palmatifid, 7–14 mm across, divided into 3 segments, with the incisions extending 70–90% of lamina radius; upper surface bright

green, glabrous; lower surface pale green, glabrous or with 1–5 white trichomes. Lamina segments narrowly to broadly cuneate (45–120 degrees of arc), 3.5–7 mm long, 2.5–6 mm wide, central segment with two shallow sinuses, apex 3-lobed and sometimes with a small acute tooth on each side; lateral segments with 3–8 teeth, with one moderately deep sinus (0.2–0.4 times segment length) and apex with 2–4 lobes. Inflorescences simple, umbellate, 4–8 flowered, peduncles 5–15 mm long (shorter than adjacent petiole), pedicels almost lacking at anthesis, bracts c. 0.7 mm long. Calyx absent. Petals white or purple, deltate, 0.7–0.8 mm long. Styles 2, each 0.3–0.4 mm long in fruit. Fruits comprising two laterally compressed mericarps, each 0.6–0.8 mm long, 0.45–0.6 mm wide. Dorsal and lateral ribs acute, marginal ribs obscure; surface smooth or with a few irregular papillae. Fruiting pedicels 0.2–0.6 mm long. **Fig. 5.**

Specimens examined: **Queensland.** COOK DISTRICT: Eubenangee Swamp, N of Garradunga, Dec 1941, *Blake* 14498 (BRI). NORTH KENNEDY DISTRICT: Cardwell, Sep 1935, *Blake* 9686 (BRI); Murray River, Bruce Highway, Jul 1960, *Trapnell* 47 (BRI).

Distribution and habitat: Confined to coastal areas of north Queensland between Innisfail and Cardwell (**Map 1**). It grows in moist areas in fragmented rainforest or as a component of *Melaleuca* dominated forests. Altitudes are between 0–30 metres.

Phenology: Flowers and fruits have been recorded between July and December.

Affinities: *H. oraria* differs from *H. tripartita* by its simple leaves. The leaf segments of *H. oraria* bear only 3–8 teeth (12–30 teeth on the leaflets of *H. tripartita*), the fewer hairs on the lower leaf surface and petiole, and the 4–8 flowers per umbel (8–14 flowers for *H. tripartita*). *H. oraria* is also related to *H. paludosa*, but differs by the simple leaves, the lateral segments less deeply divided, the 3–8 terminal teeth per segment (10–16 teeth on the leaflets of *H. paludosa*), and the mostly shorter petioles and peduncles (**Table 1**).

Conservation status: Data deficient (IUCN 2001). The few known collections probably are not indicative of its abundance. A survey is needed to determine the degree of threat to the species.

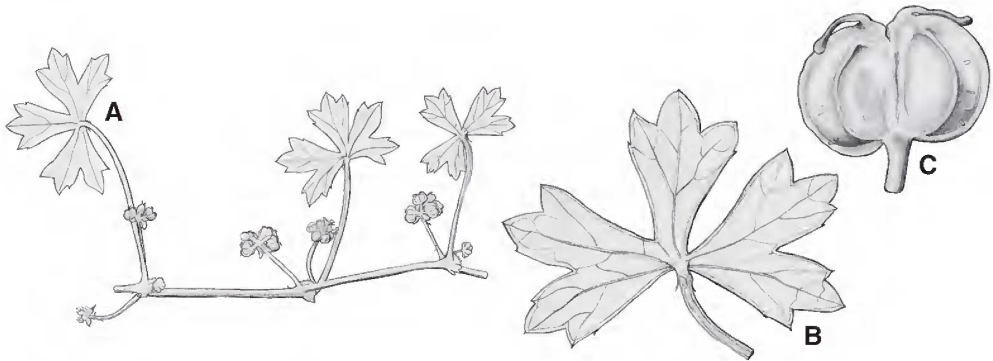


Fig. 5. *H. oraria*. A. fruiting stem. B. leaf underside. C. fruit. A,B from *Bean* 8214 (BRI); C from *Bean* 8218 (BRI).

Etymology: From the Latin *orarius* meaning ‘of the coast’. This species is apparently confined to coastal lowlands.

Hydrocotyle paludosa A.R.Bean sp. nov. affinis *H. tripartitae*, autem foliis segmentis laminae angustioribus sparsim dentatis, glabris vel sparsim pubescentibus infra, petiolis pilis albis ad apicem limitatis, fructibus saepe papillosis superficialibus, mericarpis longioribus differt. **Typus:** Queensland. MORETON DISTRICT: Nairn Road, Morayfield, c. 35 km N of Brisbane, 11 March 2000, A.R. *Bean* 16124 (holo: BRI; iso: MEL, NSW).

Perennial herb with creeping stems, mostly rooting at the nodes. Leaves occurring singly at the nodes. Stipules broader than long, 0.7–0.9 x 1–1.2 mm, brown-streaked, margin entire or fimbriate. Petioles 20–160 mm long, with 5–20 white retrorse hairs near the apex, c. 1.5 mm long, otherwise glabrous. Lamina trifoliolate, 8–25 mm across; upper lamina surface bright green, glabrous or with 1–10 erect white trichomes, each 0.7–1.5 mm long; lower surface pale green, glabrous or with 1–10 white trichomes. Leaflets narrowly cuneate (30–60 degrees of arc), 4.5–14 mm long, 3–8 mm wide, central leaflet with two shallow sinuses, apex 3-lobed with a small acute tooth on each side; lateral leaflets with 10–16 teeth, with one deep sinus (0.6–0.8 times leaflet length) and apex with 3–5 (rarely more)

small teeth. Inflorescences simple, umbellate, 6–11 flowered, peduncles 10–40 mm long (shorter than adjacent petiole), pedicels almost lacking at anthesis, bracts c. 0.5 mm long. Calyx absent. Petals white or purple, deltate, 0.5–0.8 mm long. Styles 2, each 0.3–0.4 mm long in fruit. Fruits comprising two laterally compressed mericarps, each 0.7–0.8 mm long, 0.5–0.6 mm wide, surface smooth or often with a few irregular papillae. Dorsal and lateral ribs prominent, acute, marginal ribs obscure. Fruiting pedicels 0.5–0.8(–1.5) mm long. **Fig. 6.**

Specimens examined: Queensland. PORT CURTIS DISTRICT: Compartment 28, S.F. 898, N of Watalgan, Oct 1996, *Bean* 11052 (BRI). BURNETT DISTRICT: Mt Perry, undated, *Keys* s.n. (BRI); Maidenwell–Nanango road, at Kingaroy turnoff, Sep 1996, *Bean* 10642 (BRI, MEL); N end of Tarong S.F., c. 13 km SW of Nanango, Apr 1998, *Bean* 13185 (BRI); Ettiewyn, Jan 1999, *Fensham* RJF3623 (BRI). WIDE BAY DISTRICT: Verrierdale road, 8 km W of Peregrin Beach, May 1990, *Bean* 1590 (BRI); Hortons Camp Creek headwaters, 4 km from Didcot on Gooroolba road, Feb 1999, *Forster* PIF24077A (BRI). MORETON DISTRICT: Kedron Brook, undated, *Bailey* s.n. (BRI); Doonan Creek swamp, 5 km W of Peregrin, Dec 1993, *Bean* 7193 (BRI); Yandina–Dunethin Rock road, Dec 2000, *Bean* 17099 (BRI); German Church Road, Mt Cotton, SE of Brisbane, Nov 2001, *Bean* 18155 (BRI); Albert River, S of Brisbane, Aug 1930, *Hubbard* 3854 (BRI, K); Jacobs Well, c. 0.4 km from shore, Sep 1995, *Leiper* (BRI); 0.5 km N of Warwick Street, Coolum Beach, Dec 1982, *Sharpe* 3281 & *Windolf* (BRI). New South Wales. NORTH COAST: adjacent to Bungawalbin N.P., SE of Casino, Sep 1999, *Bean* 15464 (BRI).

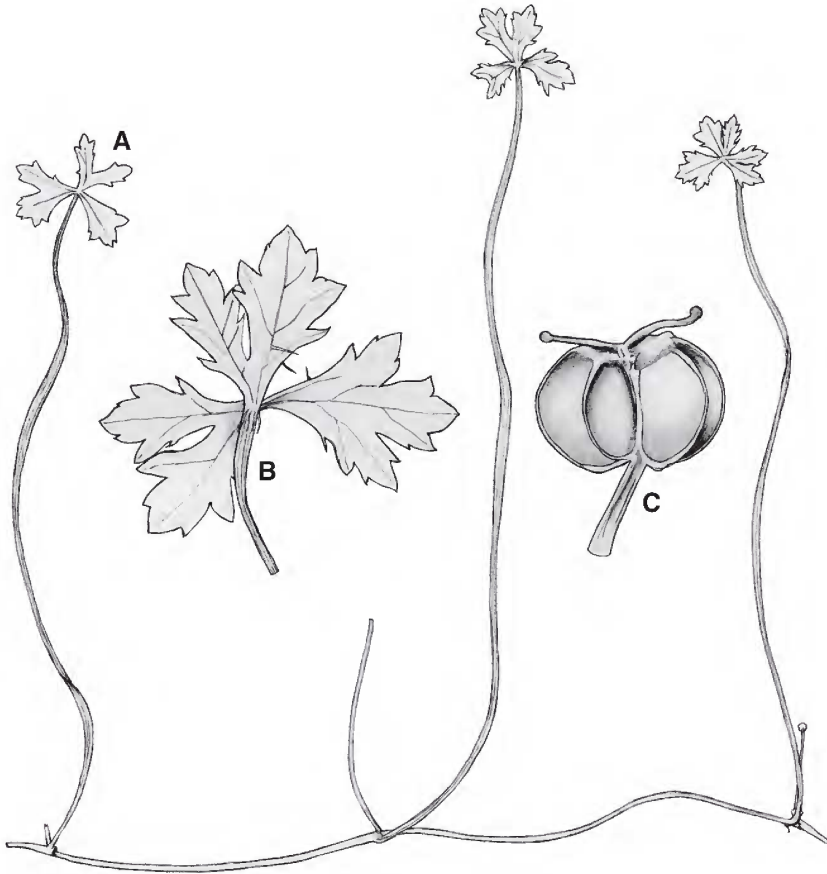


Fig. 6. *H. paludosa*. A. flowering stem. B. leaf underside. C. fruit. A–C from *Bean 16124* (BRI).

Distribution and habitat: Distributed from north of Bundaberg to south-east of Brisbane in Queensland (Map 1), and also known from near Casino in New South Wales. It is found in coastal or near-coastal areas, very often in *Melaleuca quinquenervia* dominated forest, in association with species in the family Cyperaceae. Sites are invariably poorly drained.

Phenology: Flowers and fruits have been recorded throughout the year.

Affinities: *H. paludosa* is morphologically similar to *H. tripartita*, but differs by the narrower sparsely-toothed leaflets (30–60 degrees of arc, 6–14 teeth vs. 60–90 degrees, 12–33 teeth for *H. tripartita*); the deeply divided

lateral leaflets (0.6–0.8 times length of leaflet vs. 0.3–0.6 times for *H. tripartita*); the leaflets longer than broad (length less than breadth for *H. tripartita*); the 0–10 hairs on the lower leaf surface (hairs 20–100 on lower surface for *H. tripartita*); the petiole hairs white and confined to apex (brown-white and extending some distance along petiole for *H. tripartita*); and the fruit surface often papillose (smooth for *H. tripartita*) (Table 1).

Conservation status: This species is widely distributed and not uncommon. No conservation coding is recommended.

Etymology: From the Latin *paludosus* meaning marshy or swampy, referring to the habitat.

Table 1 - Comparison of *Hydrocotyle tripartita* and its allies

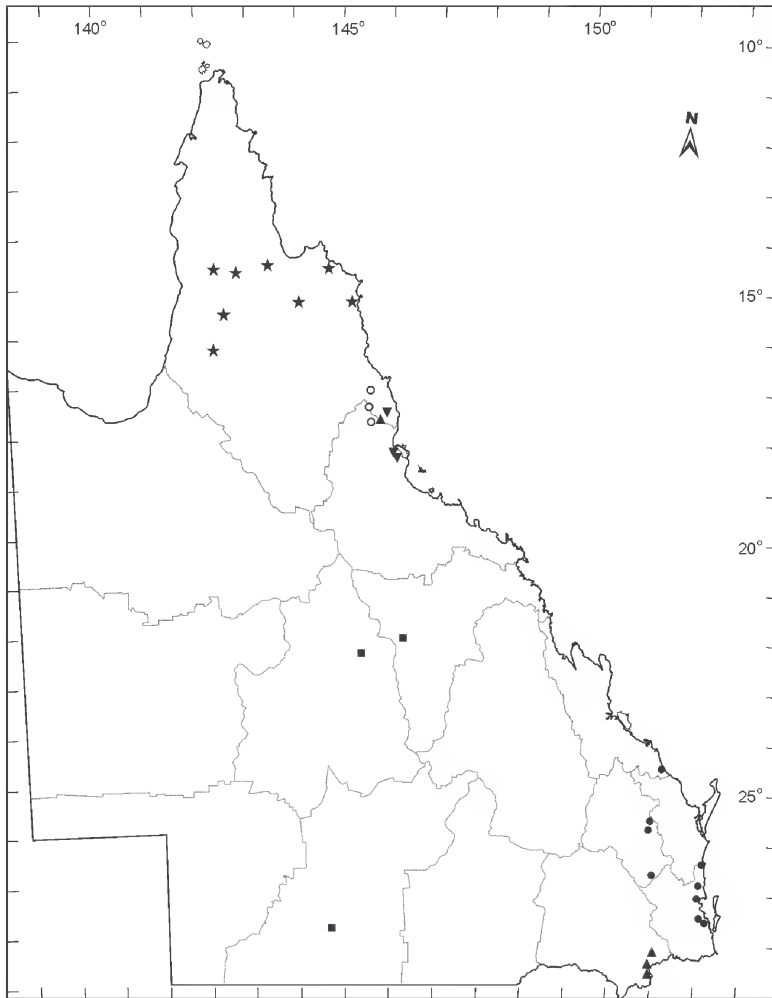
Character	<i>H. tripartita</i>	<i>H. paludosa</i>	<i>H. digitata</i>	<i>H. oraria</i>
leaf form	trifoliolate	trifoliolate	trifoliolate	palmatifid
leaf segment/leaflet angle (degrees)	60–90°	30–60°	60–90°	45–120°
division of lateral leaflets/leaf segments	0.3–0.6	0.6–0.8	0.7–0.9	0.2–0.4
number of lobes or teeth per leaf segment or leaflet	12–33	10–16	19–28	3–8
number of hairs on lower surface of lamina	20–100	0–10	20–50	0–5
petiole hairs; number, colour and position	10–30 white and brown at junction with lamina and along distal part	5–20 white at junction with lamina only	10–30 white and brown at junction with lamina and sometimes along distal parts	5–10 white at junction with lamina only
peduncle length (mm)	13–35	10–40	4–9	5–15
mericarp surface	smooth	often papillose	smooth	smooth or papillose
mericarp length (mm)	0.6–0.8	0.7–0.8	0.9–1.2	0.6–0.8

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References

- DURETTO, M. (1999). *Hydrocotyle*. in Flora of Victoria, Volume 4. (eds N.G. Walsh & T.J. Entwisle). Melbourne: Inkata Press.
- EICHLER, HJ. (1965). Supplement to J.M. Black's Flora of South Australia, edition 2. Adelaide: Government Printer.
- EICHLER, HJ. (1986). *Hydrocotyle*, in Flora of South Australia, Volume 2. (eds J.P. Jessop & H.R. Toelken). Adelaide: South Australian Government Printing Division.
- HENDERSON, R.J.F. (ed.) (2002). Names and Distribution of Queensland Plants, Algae and Lichens. Brisbane: Environmental Protection Agency.
- HENWOOD, M.J & HART, J.M. (2001). Towards an understanding of the phylogenetic relationships of Australian Hydrocotyloideae (Apiaceae). *Edinburgh Journal of Botany* 58: 269–89.
- IUCN. (2001). *IUCN Red List Categories and Criteria: Version 3.1*. IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK. ii + 30 pp.
- MATHIAS, M.E. & CONSTANCE, R.L. (1975). 145. Umbelliferae. in Flora of Ecuador (eds G. Harling & B. Sparre). *Opera Botanica* Ser. B, No. 5.



Map 1. Distribution of *Hydrocotyle* spp. (square) *H. dipleura*; (star) *H. tumida*; (open circle) *H. miranda*; (triangle) *H. digitata*; (reverse triangle) *H. oraria*; (closed circle) *H. paludosa*.

PLUNKETT, G.M., SOLTIS, D.E. & SOLTIS, P.S. (1996). Higher level relationships of Apiaceae and Araliaceae based on phylogenetic analysis of *rbcl* sequences. *American Journal of Botany* 83: 499–515.

PLUNKETT, G.M., SOLTIS, D.E. & SOLTIS, P.S. (1997). Clarification of the relationship between Apiaceae and Araliaceae based on *matK* and *rbcl* sequence data. *American Journal of Botany* 84: 565–80.

TSENG, C.C. (1967). Anatomical studies of flowers and fruit in the Hydrocotyloideae (Umbelliferae). *University of California Publications in Botany* 42: 1–79.

WAKEFIELD, N.A. (1951). Notes on some Australian species of *Hydrocotyle*. *Victorian Naturalist* 68: 7–9.

WAKEFIELD, N.A. (1955). Genus *Hydrocotyle*: A new species from the Australian Alps. *Victorian Naturalist* 72: 55.